

Descriptions of Extinct Vertebrata from the Permian and Triassic Formations of the United States.

BY E. D. COPE.

(*Meeting of the American Philosophical Society, November 2d, 1877.*)

The Triassic formation of North America has yielded many of the reptilian types which characterize the horizon in other parts of the world. A Labyrinthodont has been recognized in North Carolina, and I have determined the existence of the genus *Belodon* in the formation in both that State and Pennsylvania. Of *Dinosauria* three types occur in both Europe and North America. The *Paleosaurus* of the former country is represented by the American *Clepsysaurus*, and *Zanclodon* is somewhat similar in dental characters to the *Zatomus* of North Carolina. Of genera with compressed teeth which have a lenticular section, and both edges denticulate, *Bathygnathus* has been found in North America, and *Cladiodon* and *Teratosauros* in Europe. This type has, however, been wanting heretofore from the extinct Triassic fauna of Pennsylvania and North Carolina. The present communication introduces it for the first time from the former State, under a form generically different from any of the preceding, and with the name

PALEOCTONUS APPALACHIANUS.

The specimens on which this determination rests, were found by my friend Charles M. Wheatley, A. M., in one of his copper pyrites mines. The most characteristic are two teeth which differ somewhat from each other in form. One of them has a greater transverse, and less anteroposterior diameter, indicating an anterior position in the series. The other is more compressed, and presents a greater anteroposterior width. Judging by the analogy of the genus *Lolaps*, this tooth occupied a position posterior to the first one. The two were found in close proximity, though not in actual contact, in a fragile, argillaceous portion of the copper-bearing rock.

The profile of the anterior tooth is regularly conic with a slight recurvature, which is not seen in the apex, but in the basal portion of the crown, and in the root. The section is almost semicircular at all points, but the inner and flatter face is slightly convex; rather strongly so at the apex. The denticulation of the edges is minute, measuring M. .00033. It continues to the base of the crown both fore and aft. At this point the edges are as elsewhere, at one side of the anterior and posterior aspects. There are no ridges nor facets on the crown, and the enamel possesses an obsolete minute rugosity of short linear ridges.

The crown of the second tooth is not only flatter and wider than that of the first, but is little more than half as long. Both edges are crenate to the base. The marked peculiarity of the tooth is seen in the division of the crown into facets by angular ridges. The convex face is divided into two, an anterior-looking and a posterior-looking, the former half as wide

as the latter. The angle separating them is not continued on the apical third of the crown. The section of the antero-external face is nearly plane. The division of the interior or flatter face is similar, but the angle is less pronounced. The anterior and narrower face is slightly concave. In this crown, as in the first described, there are weak transverse undulations near the basal third.

<i>Measurements.</i>		M.
Length of anterior tooth preserved.....		.080
Length of crown of same.....		.055
Diameter of base of crown	{ antero-posterior.....	.022
	{ transverse.....	.016
Diameter near apex of same	{ antero-posterior.....	.010
	{ transverse.....	.008
Length of posterior tooth preserved.....		.040
Length of crown of second tooth.....		.029
Antero-posterior diameter at base of crown.....		.025
“ “ “ at middle of crown.....		.019
Transverse diameter “ “ “.....		.010

These dimensions indicate an animal of the general proportions of the gigantic carnivorous *Dinosauria* of the genera *Laelaps*, *Megalosaurus* and *Teratosaurus*. They exceed those of the *Bathygnathus borealis* and the only known species of *Cladiodon*, *C. lloydii*.

The characters which demonstrate that this Saurian belongs to a genus distinct from any of the above are, Firstly, the presence of the external and internal longitudinal ridges which divide the crown of the posterior tooth into four facets. Second, the shortness of the crown as compared with its width, a point in which it approaches *Palæosaurus*. Thirdly, the semicircular section of the anterior tooth, a form not found in either *Bathygnathus* or *Teratosaurus*, where almost the entire series is known. It is only approximated in some of the Western species referred to *Laelaps*, but is not inconsistent with the characters of that genus as represented by them.

To the genus thus characterized, the name *Palæoctonus* is given, and to the species, the name *Palæoctonus appalachianus*.

Associated with the teeth of this species, were found several leaves resembling those of *Pterophyllum*; and stems of *Calamites* occur in the same locality.

Additional specimens received from Mr. Wheatley include anterior, intermediate and posterior teeth of a larger animal than the one above described, and intermediate and posterior teeth of a much smaller individual of probably the same species.

The large half-conical tooth of the large individual, presents a slight groove-like constriction at the basal portion of the posterior cutting edge. Length of crown above base .060; width at base .025. Width of posterior tooth at base .030. The form of the intermediate tooth is between those of the others. Its external face is very convex and is not faceted. The

approach of the external face to the anterior or cutting edge is much more abrupt than to the posterior.

The teeth of the smaller saurian only differ from the others in their size. The more posterior is probably anterior in position to those described above, as its external face is more convex, especially anteriorly, and is not faceted. Length of crown of the anterior tooth .032; width at base .019. Width of base of posterior tooth .015; length .019.

PALÆOCTONUS AULACODUS, sp. nov.

The teeth of this saurian differ from those of the *P. appalachianus* in having their basal portion sculptured with parallel shallow grooves. These are quite close together, leaving ridges between them which are narrower than themselves. The surface of the crown displays the silky sculpture of minute raised lines more distinctly than in the other species. But one tooth of this animal has been so far obtained by Mr. Wheatly, and this one is from the middle of the series of an animal rather smaller than the second individual of the *P. appalachianus*. In accordance with this position the crown is short and half conic with the external face strongly convex, most so in front. The denticles are well exhibited on both edges, but only descend on the anterior to the middle of the length of the crown. In both large and small specimens of *P. appalachianus* the denticles descend nearly or quite to the base. Length of crown .022; width at base .011.

CLEPSYSAURUS VEATLEIANUS, sp. nov.

Represented by a single large tooth in perfect preservation. In accordance with the characters of the type species, *C. pennsylvanicus* of Lea, the tooth is straight, and possesses two cutting edges. The posterior of these is denticulate and perfectly straight; the other is less extensive and is separated from the posterior by very unequal surfaces.

In the present saurian the tooth is compressed, and rounded in front, the section throughout the basal half being an oval with one end acute. The antero-interior edge only exists on the apical half of the crown, and is separated from the posterior edge by a somewhat convex face two-thirds the width of the external face. It is not denticulated, and its lower extremity falls behind the anterior margin of the crown when viewed in profile. The enamel is perfectly smooth. Length of crown from base of enamel layer .047; longitudinal diameter at base .018; transverse do. 011.

As compared with the *C. pennsylvanicus* of which several teeth are known, the *C. veatleianus* differs in its more compressed form, and in having the anterior cutting edge not denticulated. The position of this edge is more internal than in the longer known species, but this may indicate a more anterior position in the jaw.

This saurian is named in compliment to Charles M. Wheatley, A.M., of Phoenixville, Pa., to whose exertions we owe nearly all the material hitherto obtained from the Triassic formation of Pennsylvania.

SUCHOPRION CYPHODON, gen. et sp. nov

Char. gen. As no portion of the animals referred to this genus is known, other than teeth, the characters are derived from these only. Their crowns are elongate, conical and curved, and are furnished with denticulate cutting edges. In the teeth preserved these are separated by very unequal extents of surface, as they form the anterior and posterior borders of the inner face. The crown is penetrated by a very minute pulp cavity, and it consists of a number of distinct concentric cones.

It is probable that teeth have been discovered in Europe which belong to saurians of this genus, but I cannot find that they have ever received a distinctive name. They resemble those of *Crocodylia* rather than *Dinosauria*.

Char. specif. The only species of *Suchoprion* as yet known to me is represented by four teeth found in the same beds and formation as those above described. One of these is of large size, indicating that it reached the adult dimensions of the Gangetic gharrial. They display some difference in the degree of convexity of the external surface, which is sometimes opposite the imaginary plane of the inner face, sometimes oblique to it. The degree of convexity is always greatest at the base of the crown. The inner face is also convex. The curvature in the long direction is not great, and is directed to the inner side. The surface presents a minute silky sculpture; one tooth presents a very few shallow sulci.

<i>Measurements.</i>		M
Diameter of largest tooth	antero-posterior.....	.021
	transverse.....	.020
Length of crown of tooth No. 2.....		.045
Diameter crown tooth 2	antero-posterior.....	.009
	transverse.....	.016

BELODON CAROLINENSIS, Emmons.

Cope, Trans. Amer. Philos. Soc. 1869, p. 59.

Teeth of the anterior portions of the jaws were obtained by Mr. Wheatley.

BELODON PRISCUS, Cope.

Trans. Amer. Philos. Soc. 1869, p. 59.

Teeth from the anterior part of the jaws. In addition to the six species of saurians above noted, Mr. Wheatley obtained the tooth of a Stegocephalous Batrachian, probably a Labyrinthodont.

CRICOTUS GIBSONII, Cope, sp. nov.

While examinations into the Clepsydrops shale of Eastern Illinois have revealed a great abundance of individuals, and three species of *Clepsydrops*, the genus *Cricotus* has remained without addition, and the three vertebræ hitherto found, appear to belong to but one species, the *C. heteroclitus*. The present notice describes a second form, represented, like the first, by but few

remains. The vertebra which is best preserved, and which may be regarded as typical, is probably from the caudal series, and is thus well contrasted with the corresponding typical vertebra of the longer known species.

On this vertebra there is no trace of diapophysis, and the neurapophysis rises from the external side of the superior face. The wall of the neural canal is not preserved, but the inference is that the diameter of the latter is large. This fact and the absence of definite chevron articulations leads me to doubt the caudal position of the vertebra; but the usual marks of the dorsal and cervical vertebrae are totally wanting from it. As in *C. heteroclitus*, the *foramen chordæ dorsalis* is large, its diameter being one-third of the total. The articular faces descend steeply into it, that of one extremity more so than the other. The rim of the latter face is beveled outwards, the plane thus produced appearing on the inferior face something like the united faces of the chevron bones.

The centrum is a little deeper than wide, and the inferior face is truncate so as to give a subquadrate outline. The inferior plane is concave, the concavity being divided by a longitudinal rib. The sides are somewhat concave, with a longitudinal rib at the middle. Diameters of centrum: vertical .010; transverse .009; longitudinal .008. Width of inferior plane .005; width above, including neurapophyses, .008.

As compared with *C. heteroclitus* this species differs in the presence of parallel ridges enclosing a median fossa on the inferior side of the centrum. The small size may be here considered, but it is uncertain whether the two animals represented by the vertebrae are fully grown.

This reptile is named in recognition of the services of William Gibson of Newport, Ia., who has added a number of interesting facts to the geology of the Wabash region.

Cricotus discipiorus, Cope, sp. nov.

A vertebra, representing an animal as large as the *C. heteroclitus*, presents characters so much at variance with those of the latter as to require special notice. Three other vertebrae of smaller size present similar features.

The centrum is disciform, with very short antero-posterior diameter, which is, however, greater at one part of the surface than at the opposite point. The *foramen chordæ dorsalis* occupies about one-fifth of the transverse diameter, which is subequal in all directions. The articular faces of the centrum are slightly concave. The margin of that of one side is beveled for the superior two-thirds of the circumference, the bevel running out below by turning into the articular face. The latero-inferior border of the latter turns out into an obtuse angle at this point. The superior part of the bevel runs into the lateral face of the centrum. The attachment of the neural arch is obscure or wanting in the specimen, and the same is true of any facet for chevron bones.

Diameter of articular face	}	vertical.....	.025
		transverse.....	.025
Length of centrum below.....			.009
“ “ above.....			.007

Another vertebra of nearly the same character, and one-half smaller size, presents a greater difference between the long diameters of the upper and lower sides. The superior diameter is only one-half the inferior, and the foramen chordæ dorsalis much nearer the superior than the inferior margin. Its diameter is one-fourth the vertical and one-third the transverse diameter.

From the same locality and discoverer as the *C. gibsonii*.

LYSOROPHUS TRICARINATUS, Cope, gen. et sp. nov.

Char. gen. Vertebrae amphicælian, perforated by the foramen chordæ dorsalis. Neural arch freely articulated to the centrum. Floor of neural canal deeply excavated. No processes nor costal articulations on the centrum, which is excavated by longitudinal fossæ. Centrum not shortened.

This genus resembles in the proportions of the centrum, the genus *Olepsydrops*, but differs in many details.

Char. specif. Two centra and a portion of a third represent this species. The former are a little longer than wide and a little depressed. The facet for the neural arch is an elongate plane truncating the border of the fossa of the neural canal on each side, for one-half to three-fifths the length of the centrum. Two deep longitudinal fossæ extend on each side of a median rib of the inferior face; and they are separated above by a narrower rib from another longitudinal fossa which is below the base of the neural arch.

	<i>Measurements.</i>	M.	
Diameter of centrum	{	longitudinal.....	.0055
		vertical.....	.0038
		transverse.....	.0040
Length of facet for neurapophysis.....		.0035	
Width of neural canal.....		.0020	

Discovered by Wm. Gurley, near Danville, Illinois.

DIPLOCAULUS SALAMANDROIDES, gen. et sp. nov.

Char. gen. Vertebral centra elongate, contracted medially, and perforated by the foramen chordæ dorsalis; coössified with the neural arch, and supporting transverse processes. Two rib articulations one below the other, generally both at the extremities of processes, but the inferior sometimes sessile. No neural spine nor diapophysis; the zygapophyses normal and well developed.

The vertebrae of this genus much more nearly resemble those of a salamander than any hitherto found in this formation, but it will be necessary to observe the cranium before this point can be determined.

Char. specif. One of Dr. Winslow's and two of Mr. Gurley's sendings contain vertebrae of this species. One from the latter gentleman is contained in a mass of clay in immediate contact with a mandibular ramus which supports a number of teeth. The ramus appears rather too

large for the animal to which the vertebra pertained, but the proportion is not different from that which I describe below in the genus *Eryops*.

The surface of the centrum is smooth and is without grooves. The diapophyses and parapophyses are rather elongate, and are closely approximated one above the other. The superior process issues from the centrum opposite the superior margin of the articular faces. They stand equidistant from the extremities of the centrum, and are directed obliquely backwards. The anterior zygapophyses occupy the same level. The neural spine is a compressed longitudinal ridge; it divides behind, leaving a notch between the posterior zygapophyses.

	<i>Measurements.</i>	M	
Diameter of centrum	{	longitudinal.....	.0060
		vertical.....	.0025
		transverse.....	.0025
Depth of centrum and neural arch.....		.0060	
Width with transverse processes.....		.0070	
Expanse of posterior zygapophyses.....		.0050	

The mandibular ramus which accompanied one of the vertebræ is shallow and stout. Its external surface is sculptured with sharp longitudinal ridges, which inosculate more or less. The teeth have cylindrical roots which occupy shallow alveoli sunk in a plane surface. The crowns are rather elongate and compressed near the apex, and without grooves or serræ. In contact with the jaw is an osseous fragment with a pitted or reticulated surface.

Depth of ramus.....	.0030
Length of crown of tooth.....	.0023
Four teeth in.....	.0040

ERYOPS MEGACEPHALUS Cope gen. et. sp. nov.

Char. gen. The details of the structure of this genus are derived from an almost entire cranium with underjaw, which is accompanied by numerous vertebræ and other bones. The form is Labyrintholont, and embraces the largest species of that group yet known from this continent.

The skull is not elongate, and the quadrate bones are produced far backwards. The epiotic processes are present but not remarkably elongate. The temporal fossa is covered in by the usual roof. The orbits are round, posterior in position, and small. There is no postorbital depression or groove, and the lateral epiotic sinus is not deep. The nostrils are large and widely separated. There is no angular process of the mandible. The maxillary teeth are of different sizes, although arranged in a single row. The posterior are small and not closely placed; large teeth appear anterior to the middle. The premaxillary bone supports a number of large teeth. Those of the mandible which are visible in the specimen in its present state, those opposite the nares, are of medium size. The form of the crowns of the teeth is conic, with weak fore and aft cutting edges. There

are no distinct fissures of the surface although these may be represented by some fine parallel lines.

Vertebrae referred to this genus are small in proportion to the dimensions of the skull. They are not discoidal but somewhat elongate; are biconcave, and are not perforated for the notochord. The middle portion of the centrum is contracted. One articular extremity has the borders of the concave centre, convex. Zygapophyses large. Ribs present short; neural spines elongate, stout.

In comparing this genus with those described by authors and arranged by Mr. Miall in his family *Euglypta*, its exclusion from the latter is evident in view of the absence of angular process of the mandible, and the nondiscoidal vertebrae. Its posteriorly placed orbits distinguish it from the genera of his second family, the *Brachyopina*, excepting perhaps *Rhinosaurus*. It is with the genera of the third family, the *Chauliodonta*, that affinity appears to exist. It is unnecessary to compare *Eryops* with *Loxomma*, which has immense and irregularly shaped orbital openings, and trenchant teeth; but with *Zygosaurus* and *Melosaurus* the affinity is closer. The deep postorbital depressions, and the grooved maxillary teeth, described by Eichwald in the former genus, separate it at once. The teeth of *Melosaurus* are equally distinct, being, according to Meyer, conical and deeply grooved at the base. In *Rhinosaurus* the maxillary and mandibular teeth are said to be sub-equal. *Leptophractus* has deeply grooved teeth with strong cutting edges.

Char. specif..—In this category I include many of those introduced into the generic diagnosis by Mr. Miall in the very useful report to the British Assoc. for the Advancement of Science, 1874, p. 149, by the Committee on the Structure and Classification of the Labyrinthodonts. Such are the width of the interorbital space, the outline of the muzzle, the details of the sculpture, the approximate number of the teeth, etc.

The cranium has a sub-triangular outline, with the sides a little longer than the base, and the apex (muzzle) very obtuse. The profile is elevated behind, and the sides slope steeply to the mandible; the slope of the muzzle is rather steep, but less so than that of the cheeks. The extremity of the snout is broadly rounded and depressed, and overhangs the mandible. The supra-occipital outline is concave, and the epiotic angles only moderately prominent. The quadrate bones extend far posteriorly, and are horizontal above at their distal extremities. The orbits are nearly round, although somewhat wider than long, and they are directed equally outwards and upwards. The inner margin is slightly flared upwards, and it terminates anteriorly and posteriorly in a slight tuberosity, at the junction with the canthus rostralis and temporal ridge respectively.

The orbit occupies the anterior portion of the posterior third of the length of the skull, including the epiotic angles; and its long diameter is one-seventh that of the skull from the epiotics to the muzzle inclusive. The same diameter is about half of the interorbital width. The parietal region is plane, the frontal gently concave, and the muzzle depressed convex

in cross-section. The face in front of the orbit is concave below the canthus rostralis. The nostrils are not large, and are sub-round. They are widely separated, being nearer the maxillary border at its junction with that of the premaxillary, than to the median line. The mandible is shallow, and not very stout. Its inferior border rises from below a point a little in front of the fundus of the epiotic sinus to the angle, which is at the quadrate articulation. Symphysis short.

The sculpture of the anterior portions of the muzzle is coarsely punctate; on the posterior portions of the upper and lower jaws it is ridged and pitted. Most of the upper surface of the skull is still covered with a thin layer of the matrix, so that the sculpture and the character of the lyra, if any there be, remains unknown.

The teeth, as has been observed, are not visibly grooved, but the characteristic feature of the group may be represented by numerous delicate crack-like lines which one sees on the basal portions. These, however, look like the result of weathering. The sections of all the teeth would be round, but for the cutting edges, which are not very prominent. In addition, the premaxillary teeth are coarsely fluted on the median half of their length. The fluting is not visible on an antero-lateral mandibular tooth, nor on a posterior maxillary tooth. The microscopic structure of the teeth is not yet investigated.

The bodies of the vertebrae have concave sides, and a sub-round section. Their neural spines terminate in an obtuse enlargement. Many of the characters of the vertebral column are yet concealed in the matrix. The distal portions of the ribs are straight, cylindrical, and become stouter at the extremity.

Measurements.

M.

Length of cranium from the extremity of the os quad-		
ratum . . . . .	.433	
Length of cranium on middle line . . . . .	.335	
Length from end of muzzle to nostril . . . . .	.073	
Width of cranium between quadrates . . . . .	.306	
“ “ “ epiotics . . . . .	.118	
“ “ “ orbits . . . . .	.086	
“ “ at orbits . . . . .	.294	
“ “ between nares . . . . .	.085	
Diameter of orbits { antero-posterior . . . . .	.048	
“ { transverse . . . . .	.057	
Length of premaxillary tooth . . . . .	.025	
Diameter “ “ . . . . .	.007	
Length of posterior maxillary tooth . . . . .	.010	
Diameter of median “ “ . . . . .	.007	
Length of a dorsal centrum . . . . .	.024	
Vertical diameter of do. . . . .	.025	
Elevation of neural spine of do. . . . .	.050	
Length of rib on curve . . . . .	.080	

This interesting fossil was found in the Triassic formation of Texas by my friend Jacob Boll. The cranium and vertebræ were discovered in such relation as render it evident that they were parts of one animal.

STRIGILINA GURLEYANA, Cope, sp. nov.

This species is known by a single jaw or tooth in complete preservation, which was found, like the type of the genus *S. linguiformis** near Danville, Ill., by Mr. Gurley.

The tooth is quite small, its length only equaling the width of the known tooth of *S. linguiformis*. It is also narrower in proportion to the length. The root and the cutting edge are turned in opposite directions as in the other species. The principal difference between the two is seen in the character of the transverse ridges or crests of the oval face. There are two crests less, or five, with a delicate basal fold, making six, while, counting the fold there are eight in *S. linguiformis*. The anterior ridge is transverse; the others slightly convex backwards, and all are equidistant and uninterrupted, which is not the case in the older species. They are also of different form, being distinct ridges with anterior and posterior faces similar. In *S. linguiformis* the anterior face only is vertical, the posterior descending very gradually, the whole forming a series of steps. Length of ridged face .0060; width anteriorly .0035; width posteriorly .0020.

This species is dedicated to William Gurley, of Danville, Illinois, to whose zeal science is indebted for the species from that locality described in this and other papers.

Twenty species have now been obtained from the Clepsydrops shales, the exact geological position of which remains to be accurately determined. Dr. Winslow informed me that they are the bed No. 15 of Prof. Bradley's section of the Carboniferous rocks of Vermilion county, Illinois. This places them near the summit of the Carboniferous series, below two thin beds of coal (which word is misprinted "coral" in my last paper, Proceed. Amer. Philos. Soc. 1877, p. 63). I am now informed that this portion of Prof. Bradley's scale is not correct, and that No. 15 occupies a much higher position than he assigns to it. It lies unconformably above the merom sandstone of Mr. Collett, which deposit is above the coal measures and unconformable to them. The stratigraphical evidence is thus conformatory of that derived from paleontology, that the *Перьядгоря* shale occupies a position in the scale above the coal measures.

CTENODUS PUSILLUS, Cope, sp. nov.

Form narrow, the width of the base about equal to the depth. The coronal portion is narrower than the base, because the inner face is oblique, forming an acute angle with the inferior plane. There are but four crests, of which the two longer are directed in one direction, and the two shorter in another. The interior ones of both pairs form a continuous

*Proceedings Amer. Philos. Soc. 1877, p. 52.

crest which is convex inwards. The crests are straight, elevated and acute; each one supports two or three denticles, which are rectangular and little elevated. The longer ones project beyond the general outline; the shorter ones are less prominent at the extremities; all are obtuse in the vertical direction. The superior surface is smooth. The inferior is slightly concave in the transverse sense. The tooth on which this species is found is the smallest yet obtained from the formation. Length, .007; width, .003; depth at inner crest, .003.

Two specimens were found by Wm. Gurley, in Vermilion Co., Illinois, in the *Clepsydropis* shale.

I have referred two species from this formation to the genus *Ceratodus*, under the names of *C. vinslovi* and *C. paucicristatus*. While the form of these teeth is that of the genus named, the structure of the superficial layer differs in wanting the punctæ which are characteristic of *Ceratodus*, but is, on the contrary, uniformly dense, although frequently irregular. I therefore refer the two species above mentioned to another and allied genus, under the name *Ptyonodus*, with *C. vinslovi* as type.

ORTHACANTHUS QUADRISERIATUS, Cope, sp. nov.

Represented by an incomplete radial spine. With it occur several fragmentary spines which resemble very closely one belonging to *O. gracilis*, Newb. (Geolog. Survey of Ohio, Pl. lxix, fig. 7), and which only differ in having the denticles shorter. As teeth of a *Diplodus* near to or identical with *D. compressus* are common in the shale, the two may belong to the same fish. Dr. Newberry has already suggested that *Orthacanthus* and *Diplodus* are identical.

The *O. quadriseriatus* is quite different from the other species. The spine is wider than deep, and the series of denticles are widely separated. The surface between them is gently convex and smooth. The anterior face is strongly convex and presents at each side two shallow furrows. The external groove is divided by a series of thin longitudinal denticles which are smaller than those of the principal row, and which are sometimes somewhat confluent at the base. The principle denticles are closely placed, stout, acute, and recurved. Transverse diameter of shaft .0035; antero-posterior diameter .0025. The portion of the shaft preserved is straight.

ARCHILEOBELUS VELLICATUS, gen. et sp. nov.

"Species No. 4," Cope, Proceed. Amer. Philos. Soc. 1877, p. 55.

Several other specimens of the body described as above have been obtained by Messrs Winslow and Gurley. In every instance it is a tooth-like process attached to a solid base by ankylosis in the manner of the teeth of fishes. From the appearance it presents I am led to suppose that it is the only one of its series, and there are none of the numerous teeth of the collections which can be associated with it. I therefore distinguish the genus by a name and the following diagnosis.

The form is conical, and the surface is not grooved nor furnished with

prominent ridges. The interior is hollow, and the walls are composed of a few concentric layers without external enamel or cementum. The solid base to which it is attached is shallow, presenting smooth surface on the opposite side, which is deeply impressed by a longitudinal groove at one end.

The characters of this species are pointed out at the place above quoted. The measurements of a large specimen are : length .015 ; diameter of base, long .008 ; short .005.

I am not sure as to the part of the skeleton to which this body should be referred.

CLEPSYDROPS LIMBATUS sp. nov.

The discovery of a species of the genus *Clepsydrops* in Texas, in a formation hitherto regarded as Triassic, adds weight to the view above expressed, that the *Clepsydrops* shales of Illinois belong either to the Triassic or Permian formations. As typical of the new species I select a vertebra, which may be exactly compared with corresponding one of *C. collettii*. The centrum is about as wide as long, and its sides are very concave, much more so than in *C. collettii*, and the rim-like borders of the articular extremities are connected by a straight compressed hypophyseal keel. The sides of the foramen chordæ dorsalis are convex in the longitudinal section, thus contracting the opening, as compared with the very wide flare of the border of one of the extremities of the centrum. This flare receives the wide recurved border of the opposite extremity of the adjoining centrum, forming a kind of ball and socket articulation. This reflected surface forms a ridge with the funnel of the foramen at this extremity of the vertebra. The concave extremity is produced downwards, so that the foramen is considerably above the middle point. The diapophysis and parapophysis are not distinct nor elongate, but are represented by a projecting scar on the superior part of the centrum, which is directed downwards and forwards towards the rim of the articular face.

Besides the great contraction of the centrum, its relatively shorter form distinguishes it from that of *C. collettii*. It is also much larger than that species and the *C. pedunculatus*, being the largest of the genus.

	<i>Measurements.</i>	M.
Length of centrum.....		.031
Diameter of centrum	{ vertical.....	.039
	{ transverse.....	.033
Width of neural canal.....		.006
Discovered by Jacob Boll.		

On Reptilian remains from the Dakota Beds of Colorado.

BY E. D. COPE.

(Meeting of American Philosophical Society, November 2, 1877.)

Since the discovery of the huge saurian *Camarasaurus supremus* (Cope, Paleontological Bulletin, No. 25, p. 5), Superintendent Lucas has explored
 PROC. AMER. PHILOS. SOC. XVII. 100. Y. PRINTED JAN. 9, 1878.